

**M111 Mathematics as a Human Pursuit Semester 091 (NOT TO TURN IN)
Practice Test No. 1 Chapters 2A,B; 9A, B, C; 8C, D**

Units 2A,B

1. Fill in the values of the following metric prefixes:

centi	_____	deci	_____
micro	_____	deca	_____
mega	_____	milli	_____
kilo	_____	tera	_____

Potential Conversions to Use for Following Problems:

1 pound = 16 ounces

1 pound = .4536 kilograms

1 mile = 5280 feet

1 yard = 3 feet

1 foot = .3048 meters

1 yard = .9144 meters

1 inch = 2.540 centimeters

2. a) The mowing area of a yard 1560 square feet. What is the area in square meters?
b) Two inches of rain fell on the mowing area. What was the volume of that water in cubic feet? Cubic meters?

3. Michael drove 45 miles in 38 minutes. Find his speed in meters per second.

4. Coffee beans at a store in Portugal is priced at 275 escudos per kilogram, where one dollar is worth 180 escudos. What is the price of coffee in dollars per pound?

5. What is the cost of lighting a 200-watt light for two weeks if electricity costs 9 cents per kilowatt-hour?

Units 8A,B, C, 9A,B,C

6. a) **Write down the equation for the following**

The tuition T is increasing at the rate of 6% per year x .

Tuition is \$12,000 your freshman year.

b) After three years what is your tuition?

c) Linear or exponential growth?

7. a) **Write down the equation for the following:**

Your life insurance premiums are increasing \$250 per year.

Your current premium is is \$1000.

b) After five years, what is your premium?

c) Linear or exponential growth?

8. Suppose a single bacterium exists at 1:00 p.m. Each bacterium divides every 2 minutes into two bacterium. What is the number of bacteria at 1:50 p.m.?
9. Suppose an exponentially growing population has a doubling time of 25 years. If the initial population is 100,000, what will be the population after 150 years?
10. Define the term *carrying capacity*.
11. Explain the population model of *overshoot and collapse*.
12. Suppose a country currently has a population of 24 million and an annual growth rate of 3.4%. If the population growth follows a *logistic growth model* with a carrying capacity of 90 million, calculate the annual growth rate when the population is 32 million. Show your work.
 a) 2.2% b) 2.6% c) 3.0% d) 3.4%
13. Suppose that a country's population is 90 million and its population growth rate is 5.3% per year. If the population growth follows a *logistic growth model* with base rate $r = 0.083$, what is the country's carrying capacity?
 a) 124 million b) 141 million c) 206 million d) 249 million
14. If the half life of a drug in the bloodstream is 10 hours, and a 250 milligram dose is administered. How much drug is left 15 hours after this dose is administered? (*Show work*):
15. If the population of a country is now 5,000,000 and the population growth rate is 4% per year,
 a) What is the doubling time for the population?
 b) What will the approximate population be in 50 years? (*Show work*)
16. Compute each of the following using properties of logarithms -- show work *without using calculator's log function*.
- a) $\log_{10}(0.001)$
 b) $\log_{10}(1000)$
 c) $\log_{10}(2000)$, given that $\log_{10}2 = .301$
 d) $\log_{10}(1/4)$, given that $\log_{10}2 = .301$.
 e) x where $2(8^x) = 64$

Unit 8D

Earthquake Scale

$$\log_{10} E = 4.4 + 1.5M$$

$$E = (2.5 \times 10^4) \times 10^{1.5M}$$

Sound

$$\text{loudness in dB} = 10 \log_{10} \left(\frac{\text{intensity of sound}}{\text{intensity of softest audible sound}} \right)$$

$$\frac{\text{intensity of sound}}{\text{intensity of softest audible sound}} = 10^{\frac{\text{loudness in dB}}{10}}$$

pH Scale

$$pH = -\log_{10}[H^+]$$

$$[H^+] = 10^{-pH}$$

17. A sound of what loudness in decibels is 63 times as intense as a 13 dB sound?
18. How much energy in joules is released by an earthquake of magnitude 6?
19. How much more acidic is acid rain with a pH of 3.5 than ordinary rain with a pH of 6?